Asymptomatic Rupture of the Left Ventricle

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We present the case of an asymptomatic, 75-year-old female in whom perforation of the left ventricle and formation of a pseudoaneurysm was found on transesophageal echocardiography 2 months after mitral valve replacement.

Patient history showed a mitral valve reconstruction with ring implantation 16 years ago. She developed severe mitral valve regurgitation, and mitral valve replacement was performed. A mitral bioprosthesis (St. Jude Medical, Epic 29) was implanted successfully. During surgery, it was difficult to remove the annuloplasty ring. The anulus itself was very brittle. The pledged sutures were placed in the ventricle to address this issue. The postoperative course was uneventful, and transesophageal echocardiographic examination at discharge did not reveal any pathologies (Figure 1; Movie I in the online-only Data Supplement). Two months later, she was admitted to the hospital because of a new onset of atrial fibrillation. On transesophageal echocardiographic examination, we found a normally functioning mitral valve prosthesis (mean pressure gradient, 5 mmHg; mitral valve area, 2.9 cm²). The left ventricle was normal, with good global and regional systolic function; however, in the parasternal long-axis view, a round, hypoechoic space could be seen below the mitral valve ring (Figure 2; Movie II in the online-only Data Supplement). On transesophageal echocardiography performed before cardioversion, a hypoechogenic space located between the anterior wall of the left ventricle and the atrial appendage was found (Figure 3; Movie III in the online-only Data Supplement). The color Doppler examination disclosed the presence of flow inside this space (Figures 4 and 5; Movies IV and V in the online-only Data Supplement). Using a modified midesophageal view at 132°, the longitudinal shape of this structure could be recognized (Figure 6; Movie VI in the online-only Data Supplement). Three-dimensional echocardiography disclosed a longitudinal cavity of a pseudoaneurysm along the posterior mitral annulus (Figure 7; Movie VII in the online-only Data Supplement). The rupture of the left ventricle, a pseudoaneurysm entry was localized directly under the prosthetic valve ring (Figure 8; Movie VIII in the online-only Data Supplement). The rupture of the left ventricle (a pseudoaneurysm entry) was localized directly under the prosthetic valve ring (Figure 8; Movie VIII in the online-only Data Supplement). The injection of echocardiographic contrast (SonoVue, Bracco Diagnostics, Princeton, NJ) caused an immediate opacification (Figure 9; Movie IX in the online-only Data Supplement). The diagnosis was confirmed with nuclear magnetic resonance (Figures 10 and 11). The patient underwent urgent surgery. After explantation of the mitral prosthesis, the rupture of the left ventricle could be seen (Figure 12). The cavity of the pseudoaneurysm was filled with TachoSil (Takeda Pharmaceuticals International GmbH, Zurich, Switzerland), the rupture was closed with a bovine pericardial patch (Figure 13), and a new mitral prosthesis was reimplemented. The postoperative echocardiographic examination confirmed the successful closure of the pseudoaneurysm. The former cavity of the pseudoaneurysm could be seen as a hyperechogenic area (Figures 14 and 15; Movies X and XI in the online-only Data Supplement). The postoperative course was uneventful.

Rupture of the left ventricle, first reported by Roberts and Morrow in 1967, is an infrequent complication of mitral valve replacement but is associated with extremely high mortality, reaching 50% to 93% in some series. There are 5 types of rupture, according to the site. The most frequent is type I, as in the present case, in which the site of the rupture is located at the atrioventricular groove. Type II is localized at the base of the papillary muscle. Type III is located between type I and II. Types IV and V are uncommon, the first located at the lateral wall and the second at the posterior wall of the left ventricle. The tear can occur immediately in the operating room, being a cause of serious bleeding. Delayed tears can occur hours, days, or even years after valve implantation, usually presenting as pseudoaneurysms. Formation of the pseudoaneurysm in the present case was probably caused by the brittle annulus tissue. Many different operative techniques have been described to address this pathology; however, none has proved to be superior. In our opinion, the use of a bovine pericardial patch is the most effective technique.

Disclosures
None.

References
Figure 1. Two-dimensional transthoracic echocardiographic examination at discharge after mitral valve implantation (parasternal long-axis view, diastole). The mitral valve prosthesis can be seen. See corresponding Movie I in the online-only Data Supplement. Ao indicates ascending aorta; LA, left atrium; LV, left ventricle; and RV, right ventricle.

Figure 2. Two-dimensional transthoracic echocardiographic examination at admission (parasternal long-axis view, diastole). The mitral valve prosthesis can be seen. A round, hypoechoic space can be seen below the mitral valve ring (asterisk). See corresponding Movie II in the online-only Data Supplement. Ao indicates ascending aorta; LA, left atrium; LV, left ventricle; and RV, right ventricle.

Figure 3. Two-dimensional transesophageal echocardiographic examination. A hypoechoic space located between the anterior wall of the left ventricle and the left atrial appendage can be seen (asterisk). See corresponding Movie III in the online-only Data Supplement. LA indicates left atrium; LAA, left atrial appendage; and LV, left ventricle.

Figure 4. Two-dimensional color Doppler transesophageal echocardiographic examination (modified midesophageal view at 90°). Flow inside the hypoechoic space can be seen (asterisk). See corresponding Movie IV in the online-only Data Supplement. LA indicates left atrium; LAA, left atrial appendage; LUPV, left upper pulmonary vein; and LV, left ventricle.
Figure 5. Two-dimensional color Doppler transesophageal echocardiographic examination (zoomed modified midesophageal view at 88°). Flow inside the hypoechogenic space can be seen (asterisk). See corresponding Movie V in the online-only Data Supplement. LA indicates left atrium; LAA, left atrial appendage; and LV, left ventricle.

Figure 6. Two-dimensional color Doppler transesophageal echocardiographic examination (modified midesophageal view at 132°). The longitudinal shape of the hypoechogenic space can be recognized (asterisk), and flow inside can be seen. See corresponding Movie VI in the online-only Data Supplement. LA indicates left atrium; LAA, left atrial appendage; and LV, left ventricle.

Figure 7. Three-dimensional transesophageal echocardiographic examination. Longitudinal cavity of a pseudoaneurysm (asterisk) can be seen along the posterior mitral annulus. See corresponding Movie VII in the online-only Data Supplement. MV indicates mitral valve prosthesis.

Figure 8. Three-dimensional transesophageal echocardiographic examination. The rupture of the left ventricle (a pseudoaneurysm entry - arrow), was localized directly under the prosthetic valve ring; a longitudinal cavity of a pseudoaneurysm (asterisk) can be seen along the posterior mitral annulus. See corresponding Movie VIII in the online-only Data Supplement. LA indicates left atrium; LAA, left atrial appendage; LV, left ventricle; and MV, mitral valve prosthesis.
Figure 9. Two-dimensional transesophageal echocardiographic examination after injection of echocardiographic contrast. An opacification of the aneurysm cavity can be seen. See corresponding Movie IX in the online-only Data Supplement. LA indicates left atrium; LAA, left atrial appendage; and LV, left ventricle.

Figure 10. 3T nuclear magnetic resonance examination (axial plane, long-axis, 4-chamber view). *Pseudoaneurysm cavity. LA indicates left atrium; LV, left ventricle; RA, right atrium; and RV, right ventricle.

Figure 11. 3T nuclear magnetic resonance examination (sagittal plane, long axis). The pseudoaneurysm cavity can be seen (asterisk). LA indicates left atrium; LAA, left atrial appendage; and LV, left ventricle.

Figure 12. Intraoperative photograph of the left atrium (LA) after explantation of the mitral prosthesis. The pseudoaneurysm entry can be seen (asterisk).
Figure 13. Intraoperative photograph of the left atrium (LA) after closure of the pseudoaneurysm entry. The pericardial patch can be seen.

Figure 14. Two-dimensional color Doppler transesophageal echocardiographic examination (modified midesophageal view at 93°). A hyperechogenic space (asterisk) corresponds with the former pseudoaneurysm cavity filled with TachoSil. No flow can be seen. See corresponding Movie X in the online-only Data Supplement. LA indicates left atrium; LAA, left atrial appendage; and LV, left ventricle.

Figure 15. Two-dimensional transthoracic echocardiographic examination at discharge (parasternal long-axis view, diastole). The mitral valve prosthesis can be seen. A hyperechogenic space (asterisk) corresponds with the former pseudoaneurysm cavity. See corresponding Movie XI in the online-only Data Supplement. Ao indicates ascending aorta; LA, left atrium; LV, left ventricle; and RV, right ventricle.
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